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Fire Behavior & Weather

Atmosphere Study

National Park Service Fire Managers monitor weather closely, especially during fire season, as weather plays an important role in fire behavior. Fire behavior refers to the way in which fuel ignites, flames develop, and fire spreads. Existing weather conditions, such as atmospheric stability, wind, air temperature, and relative humidity, all contribute to fire behavior.

Atmospheric stability

When air is "unstable" wildfires burn hotter and more intense. Unstable air has a lot of upward motion. There are certain visual indicators that tell us whether the air is "stable" or "unstable."

— Visual indicators of unstable air: vertical growing clouds; cumulus type clouds; gusty winds; good visibility during fire; and dust devils (spiraling gusts of wind that look like little tornados).

— Visual indicators of stable air: clouds in layers; stratus-type clouds; fog layers; poor visibility during fire; and steady winds.

Temperature

The temperature of fuels (plants) and their moisture level is determined by the surrounding air temperature. Fuels ignite more readily at high temperatures.

Relative Humidity

Fuel moisture is also influenced by relative humidity – the amount of water vapor in the air. Typically, in the early morning hours when temperatures are low, the relative humidity is highest. As the sun rises, the air temperature increases, and relative humidity decreases. By late afternoon, when temperatures reach their maximum, relative humidity is at its minimum. This is the time when fuel moisture is at its lowest. As the sun goes down, temperatures go down, and the relative humidity begins to increase again.

Wind

Foehn (pronounced *fern*) winds — strong winds that occur when stable, high pressure air is forced across and down the slopes of a mountain, warming and drying the air — are typical in Southern California. These winds are called the Santa Anas. The strong, dry Santa Anas contribute to a drop in relative humidity and a decrease in fuel moisture. During a fire, winds bring a fresh supply of oxygen to fires, as well as push the fire toward a new fuel source.